

What is claimed is:

1. A metal filling method comprising steps of: forming a metal layer on an inner surface of one end of a fine hole that opens in the outer surface of a work piece; immersing said work piece in a plating solution and filling this plating solution into said fine hole; and removing said work piece from said plating solution with one of ends along an axial direction of said fine hole is still occluded and then cooling said work piece.
2. A metal filling method according to claim 1 wherein, said fine hole is a through hole that passes through said work piece, said metal layer is formed on the inner surface of at least one end of both ends in said axial direction of said through hole, and when said work piece, which has been immersed said plating solution to fill said plating solution into said through hole, is removed from said plating solution, an opening in the other end of said axial direction of said through hole is occluded with a sealing material as said one of ends along said axial direction of said fine hole.
3. A metal filling method according to claim 2 wherein, said metal layer is formed on said inner surface of the end of said fine hole that opens in the outer surface of said work piece as well as on the outer surface of said work piece extending around the end of said fine hole on which said metal layer is formed; and after immersing this work piece in said plating solution within a plating solution bath to fill said plating solution into said fine hole but prior to cooling of said work piece, said plating solution filled into said fine hole is padded at the sites where said metal layer was formed on the inner surface of the end of said fine hole that opens on the outer surface of said work piece and on the outer surface of said work piece extending around the end of said fine hole on said work piece which is removed from said plating solution; and then, a filled metal section formed by solidification of said plating solution within said fine holes, and an external metal section formed by solidification of said padded sections of the said plating solution, are formed unitarily by cooling said work piece.
4. A metal filling method according to claim 1 wherein, said work piece is a

substrate, and a non-through hole, which opens to only one of the top and bottom surfaces of said substrate, or a through hole, which open to both the top and bottom surfaces of said substrate, are formed as said fine hole in said substrate.

5. A metal filling method according to claim 3 wherein, prior to immersing said work piece in said plating solution, said metal layer around the opening of said fine hole in the outer surface of said work piece is patterned corresponding to a shape of said external metal section to be formed.

6. A member with filled metal sections having filled metal sections formed by filling metal into fine holes formed in a work piece; wherein, a metal layer is formed on an inner surface of an end of each of said fine holes that opens to an outer surface of said work piece, and a filled metal section is filled at a site that includes the end of said fine hole on which said metal layer is formed.

7. A member with filled metal sections according to claim 6 wherein, said metal layer is formed not only on the inner surface of the end of said fine hole that opens in the outer surface of said work piece, but also on the outer surface of said work piece that extends around the end of said fine hole on which said metal layer is formed, and an external metal section, which is unitarily formed with said filled metal section, and have a padded form so as to protrude from the outer surface of said work piece, are formed so as to cover said metal layer.